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PRELIMINARY REPORT
on
CONTROLLED BURNING EXPERIMENTS
Colville Indian Reservation

October, 1942

by
Harold Weaver
Forest Supervisor

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COLVILLE INDIAN RESERVATION - OCTOBER, 1942.

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Nespelem, Washington
January 4, 1943

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PRELIMINARY REPORT ON CONTROLLED BURNING EXPERIMENTS,

COLVILLE INDIAN RESERVATION - OCTOBER, 1942.

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INTRODUCTION

During the month of October, 1942, while conditions for such operations were ideal, the writer, on his own responsibility, supervised and conducted controlled burning experiments on three areas covered by dense stands of immature ponderosa pine on the Kartar timber unit of the Colville Indian Reservation. The primary purpose of these experiments is to determine if fire can be used under controlled conditions as an effective and economical silvicultural agent for the thinning of overly dense and stagnating sapling and pole stands of ponderosa pine, and, concurrently, for the lessening of the critical fire hazard through the disposal of inflammable litter.

The areas under study could have been thinned artificially by man. Past experience seems to indicate, however, that the expense of such operations would be excessive. Also, the already serious fire hazard would thereby have been aggravated to such an extent that any fire, started by lightning or carelessness, if not promptly controlled would most probably destroy the entire stand and with it the questionable benefits to be derived from the heavy thinning investment. This is the problem confronting foresters in the ponderosa pine region. Vast areas are now covered with overly dense, stagnating stands of reproduction, on which the fire hazard is steadily increasing in intensity. Can foresters justify the heavy expenditures necessary for the proper thinning by hand such stands and for their continued protection from fire? The writer thinks not if forestry in the region is ever to become a paying proposition.

As has been indicated, conditions for conducting the experiments were ideal. By October the luxuriant growth of grasses and weeds resulting from the unusually heavy precipitation of spring and early summer had thoroughly cured as a result of a two months long dry spell. These dried grasses and weeds, and the heavy needle mat under the trees, furnished abundant fuel to carry the fires along over the forest floor. In spite of this condition, however, the period of high fire hazard had passed and controlled burning could be conducted with low or moderate risk because of the steadily lengthening, frosty nights.

The facts with respect to the experiments are presented herewith:

PLOT 1.

Location and Area

The first plot, consisting of 21.5 acres, 200 yards east of the Coyote

Creek road in the northeast quarter of section 1, township 31 north, range 29 east, Willamette Meridian, was burned on the date of October 6, 1942. A detailed plane table map, entitled "Plot 1 - Experimental Controlled Burning", is attached hereto.

Topographic and Geologic Features

The plot lies along the west side of a low, broad ridge, the slope of which averages approximately 10 percent. Practically the entire plot is underlaid by glacial drift of granitic origin, for large and small boulders of this rock abound. Along the eastern boundary of the plot on the ridge top from stations 9 to 15, however, there occur several bare glaciated outcrops of solid granite rock. The sandy, gravelly soil is derived of decomposed rock of the same origin.

The Forest

The plot and an extensive adjacent surrounding area are covered by an almost pure stand of ponderosa pine, of approximate site quality IV. Douglas fir and western larch occur, however, as scattered individuals in the more sheltered draws and hollows. As is characteristic of the greatest portion of the ponderosa pine forests of the Pacific Slope, this stand is made up of even-aged groups of trees in various stages of maturity. The mature and over-mature age classes include the greatest percentage of the merchantable volume, but groups of the smaller trees in the immature and thrifty-mature age classes are very well represented.

There is abundant evidence available to indicate that the characteristic grouping of pines by various age classes has been caused by frequent surface fires of the past operating in conjunction with periodic epidemic attacks of the western pine beetle, with occasional attacks of other insects, and with windthrows. Periodically, at fairly frequent intervals, down through the ages, these stands have been swept by surface fires of varying intensity. The latest natural burn on the plot and the surrounding adjacent area occurred in the year 1920, during the Omak Ridge Fire.

In general appearance this forest is now more open and free of the stagnating reproduction stands, standing and windfelled beetle killed snags, and brush than many of the ponderosa pine stands from which fire has been excluded for the past thirty or forty years. Since the last fire a severe pine beetle epidemic has occurred, however, and occasional small and large groups of trees have been killed. In these openings there now grow dense stands of ponderosa pine reproduction, in the midst of the dead snags and windfalls.

One of the largest of these openings is entirely included within Plot 1. An examination of the bark still adhering near the bases of the numerous windfelled snags indicated that all of them had been infested by the western pine beetle. The seedlings and saplings, ranging in age from 18 to 20 years, indicate that this epidemic occurred shortly after the 1920 fire. It is possible that fuel, humidity, and wind conditions were such that the fire became unusually hot and did considerable scorching of the mature stand on this particular area, thus weakening the trees and making them particularly susceptible to beetle attacks.

Other openings, both small and large, throughout the surrounding forest were probably made at the same time, for the reproduction is of the same age. A subsequent beetle epidemic of less severity occurred during the years 1929 to 1932 inclusive, but no trees were apparently killed in plot 1 at that time.

As is indicated on the attached map, a total of 74 sample plots were mechanically selected and established within the controlled burn. These sample plots are each 10 milacres in area. The following table shows for each of these plots the count of seedlings, saplings and poles that were alive thereon before October 6th.

PLOT 1, - Table 1.

Number of live seedlings^o, saplings^{*}, and poles[!], growing on sample plots of 10 milacres area each before October 6, 1942.

Plot No.	Seed-lings	Sap-lings	Poles	Plot No.	Seed-lings	Sap-lings	Poles	Plot No.	Seed-lings	Saplings	Poles
1	7	1		28	11	67		55	12	16	
2	6	12		29	6	6		56	7	35	
3	3			30	5	7		57	16	34	
4	11	2		31	10	2		58	9	18	
5	10			32	3			59	4	14	
6	20	4		33	1	16		60	9	7	4
7	11			34	10	31	1	61	6	9	
8	11	26		35	1			62	11	5	3
9	9		1	36	0	0	0	63	0	0	0
10	2			37	0	0	0	64	17		
11			1	38	1			65	15	24	
12	27	31		39	11	5		66	4		
13	19	18		40	18	27	1	67	0	0	0
14	1	13		41	7	30		68	15	16	
15	5	8		42	22	20		69	8	2	
16	1	3	4	43	7	34		70	6		
17	5	16	3	44	3			71	9	6	
18	8	5	3	45	1	9		72	14	61	
19	10	3	2	46	0	0	0	73	13	10	
20	0	0	0	47	25			74	5	24	
21	8	26	2	48	16	5					
22	30	48		49	2	1	1				
23	2			50	6	32					
24	10	1		51	6	1					
25	15	2		52	6	7	2				
26	75	1	3	53	7	1					
27	30	27		54	14	1					
Sub, Totals	336	247	19		199	302	5		180	281	7

				Totals				715	830	31
o	Seedlings	1" to 6' in height	Total area of plots							
*	Saplings	6' to 3" D.B.H.	.74 acres, Average							
!	Poles	over 3" D.B.H.	stocking per acre				966	1122	42	

As is indicated by the above table and by the attached map, the reproduction on plot 1 is typically "patchy" with respect to density. But few seedlings and saplings are growing under the several normally stocked patches of mature trees and large poles, and considerable variation in density of stocking occurs in the reproduction stand. Also, there occur openings therein that are too small to feasibly map. It should here be explained that but few, scattered, surviving mature

trees remain on the area designated as "M over S". The reproduction growing on this area differs in no manner, with respect to density of stocking and size, from that growing on the area designated as "S".

On examination it was found that most of the seedlings listed in the above table are of the same age as the larger saplings. Obviously they are individuals that have been suppressed for want of soil moisture and light. In several of the above mentioned small openings, however, there were noted a number of seedlings that are approximately 7 or 8 years of age.

Most of the dominant and co-dominant saplings have been making excellent height growth for the past decade. However, in several of the more dense patches height growth has been below average and it is obvious that stagnation is developing because of extreme competition for the limited soil moisture.

A dense grass and weed stand, and occasional shrubs, covered the ground in the openings and under the mature trees and poles. The following species were observed:

Grasses:

Beardless wheatgrass - (Agropyron inermis)
Pinegrass - (Calamagrostis rubescens)
Junegrass - (Koeleria cristata)
Cheat - (Bromus tectorum)
Bluebunch fescue - (Festuca idahoensis)
Needle & Threadgrass - (Stipa comata)

Weeds:

Fivefingers - (Potentilla spp)
Yarrow - (Achillea lanulosa)
Balsam root - (Balsamorhiza sagittata)
Strawberry - (Fragaria spp)
Fireweed - (Chamaenerion spp)

Shrubs:

Rose - (Rosa spp)
Common snowberry - (Symphoricarpos albus)

Under the dense stands of reproduction the above grasses, weeds, and shrubs were sparsely represented or were entirely absent. The ground, instead was covered by a dense mat of pine needles.

The conditions herein described were observed on the area immediately before the burning was conducted on the date of October 6th. As has been indicated, 22 years had elapsed since the area had been burned over. Tree ring studies by Keen and others, have indicated that under natural conditions, before the advent of forest protection and attempted total fire exclusion, the ponderosa pine stands were burned over on an average of once every 15 to 20 years. Under such conditions the area

under study would probably have again been burned over by uncontrolled fire subsequent to the year 1920. Such a fire would have partially consumed the beetle killed snags and windfalls and would have thinned the dense reproduction stand. The intensity of the thinning would have depended on the fuel moisture, relative humidity and wind conditions that happened to exist at the time. The fire might have killed every seedling and sapling, or, as so frequently happened under natural conditions, it might have spared the dominant, more fortunately situated individuals for accelerated growth resulting from release from competition for the limited soil moisture by their former comrades.

The purpose of this experiment has already been stated in the introduction.

Method of Burning

On the morning of October 6, the weather appeared very favorable for burning. The sky was overcast, a gentle breeze blew from the southwest and the barometric pressure was dropping. It appeared that rain would surely fall within 24 hours.

To construct the fire trail a "20" Cletrac crawler type tractor together with a three disc Hester plow were moved to the plot from Colville Agency, a distance of approximately 14 miles, by means of a 1½ ton Chevrolet truck and trailer. This outfit was unloaded and made ready to go shortly after noon. Actual plowing of the fire line took only one hour.

In plowing the line one man scouted ahead to pick out the best route. He attempted to steer the "cat" as close to the edge of the reproduction stand as feasible, while at the same time keeping a safe distance from occasional standing snags from which live sparks might be carried over the trail. On two occasions it was necessary to make short detours through the reproduction so that particularly dangerous snags would be excluded from the burn. After going around the plot with the plow very little shovel work sufficed to completely clear the trail. The "cat" and plow were of course kept ready to go in the event that the fire jumped the trail.

The weather, meanwhile, appeared to give continued promise of early rain, though relative humidity readings were surprisingly low. The following readings were taken on the plot during the day:

<u>Time</u>	<u>R.H. percent</u>
10:00 A.M.	47 percent
12:00 N	42 "
1:30 P.M.	32 "
3:30 P.M.	31 "
4:45 P.M.	33 "

It is regretted that duff hygrometers were not available to measure the moisture content of the ground fuel. It, obviously, was exceedingly dry because of the long drought.

Shortly before the burning was started a stiff breeze began blowing from the southwest. This air disturbance, it was believed, was the prologue to the rain storm and, though the risk of burning was increased thereby, it was decided to continue for it was feared that by the following day it would be too damp to burn.

Burning was started at 2:45 P.M. by setting a back-fire by means of a Hauck torch along the fire-line from station 15 west to station 0. Then fire was started from station 15 along the fire-line on top of the ridge south to station 9. After the back-fire was set, strip fires were started farther inside the plot near stations 11, 16, and 17. These fires promptly "blew up" and crowned out patches of reproduction. Activities were then confined to patrol of the outside fire line and to observations of the fire as it burned down hill and against the wind on a semi-circular front. No trouble was experienced after it was once learned not to attempt to speed up the operation by setting strip fires. The wind-felled snags of course burned fiercely and many of the surrounding saplings were completely defoliated. Over the greatest portion of the area, however, the fire confined itself to the needle mat and dry grasses and weeds and only the lower branches and smaller individuals of the saplings were scorched.

By 6 P.M. only four or five acres in the southwestern portion of the plot remained unburned and conditions were such that it was safe for the crew to go home. By the following morning the entire plot had burned and the edge of the fire along the trail was so cold that no further patrolling was necessary.

Costs

The following are all of the costs connected with the actual burning of Plot No. 1:

Salaries and Wages:

<u>Name</u>	<u>Rate</u>	<u>No. Days</u>	<u>Amount</u>
Harold Weaver	\$11.74	1	\$11.74
Edward Whalen	8.40	1	8.40
Walter Moonaw	6.10	1	6.10
Pete Whitelaw	6.00	1/2	3.00
Sam Sturgis	5.25	1	5.25
Total		<u>4 1/2</u>	<u>\$34.49</u>

Other expenses:

Tractor Hire	1 hr. work @ \$1.80	\$1.80
" "	7 hrs. standby @ .90¢	6.30
Chevrolet Truck	29 miles @ .20¢	5.80
Pickup Truck	29 " @ .09¢	2.61
Coach	29 " @ .05¢	1.45
Coupe	29 " @ .05¢	1.45
Total		<u>\$19.41</u>

Total Cost

\$53.90

Average cost per acre burned - \$2.46

Results

It is of course too early to make authoritative statements with respect to the results obtained. It may be stated, however, that at this early date the experiment appears to be very successful. Approximately 30 to 35 percent of the saplings appear to be severely scorched and such damage is widely and evenly distributed over the area, wherever windfelled snags burned. The majority of the saplings, approximately 65 to 70 percent by number, appear to have an excellent chance of survival. The percentage of severe damage to the smaller seedlings is, of course much higher.

It is possible that many of the trees that now appear severely scorched may also survive, provided that the cambium is not entirely destroyed or the terminal buds killed. To ascertain the amount of fire damage that seedlings, saplings, and poles can sustain and still live, 200 of the doubtful trees were tagged and complete descriptions with respect to size and character of damage were recorded. These trees will be studied after the growing season starts next spring and again next fall. At the same time live and dead counts will be made on the 74 sample plots.

Some conception of conditions before and after the burning can be obtained from the photographic supplement submitted with this report. Unfortunately it was not possible to take pictures following the burning until late October and early November, at which time the sun was so far south that the lighting necessary for this type of photography was not ideal. Considerable pertinent detail can be observed, however. The camera points from which these pictures were taken have been permanently marked and witnessed so that the same trees can be photographed in future years.

The numerous dead snags and windfelled snags have been largely consumed by the fire and it is obvious that the fire hazard has thereby been reduced considerably. Only four mature trees were found to have sustained damage, two through the burning of old fire scars.

Further studies on this plot will be of considerable interest. It is possible and even probable that many of the weakened trees will be killed by insect attacks during the coming summer. Even if 50 percent of the original dense stand of saplings and poles is eventually killed through the action of the fire and insects the plot will still be amply stocked. Indeed the experiment will not be fully successful unless a rather heavy percentage of kill is attained. As has been indicated, the success of this experiment appears very hopeful.

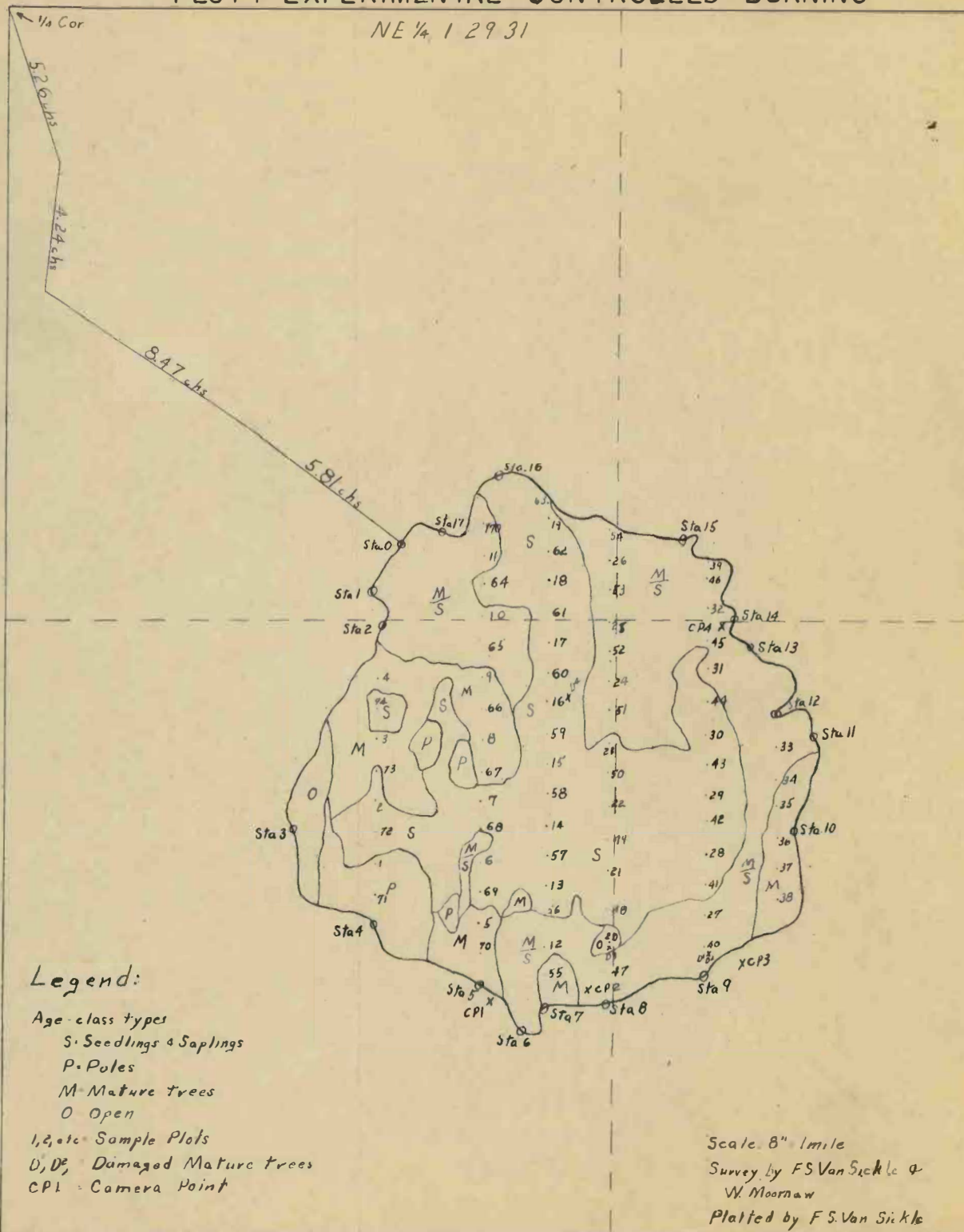
Recommendations

It is recommended that annual spring and fall studies be continued on this plot for at least the next 10 years.

It is further recommended that all logging activities be excluded from the plot for at least the next two years. After that time they should be permitted only under the close supervision of forest officers, to prevent unnecessary damage to the reproduction stand.

PLOT I- EXPERIMENTAL CONTROLLED BURNING

NE 1/4 12931



PLOTS 2 and 3

As has been indicated, Plot 1 was burned on the date of October 6, 1942. The expected rain storm failed to materialize, but the cool, cloudy weather continued very favorable for controlled burning operations. Accordingly, plot 2 was burned on the date of October 8 and plot 3 on October 9 and 10. Since these plots are contiguous one description with respect to location, geologic and topographic features and forest conditions will suffice for both.

Location and Area

Both plots include tribal lands southeast of Grant Lake in section 6, township 31 north, range 30 east, Willamette Meridian. A considerable acreage of stagnating reproduction on trust patented land in closer proximity to the lake could have been included, but it was decided to confine the burning to tribal lands and not to risk involvements with allottee owners. With respect to area, plot 2 contains 14.5 acres and plot 3 a total of 109 acres. A compass traverse map, entitled "Experimental Controlled Burning - Plots 2 and 3", is attached hereto.

Topographic and Geologic Features

Plot 2 and the extreme southwestern portion of plot 3 are practically level. To the eastward, however, the slope becomes increasingly steep until in the northeastern portion it attains a general average gradient of approximately 35 to 40 percent. One draw, with even more precipitous slopes, heads between stations 33 and 34, and drains northwest towards Grant Lake between stations 38 and 39. Another more shallow draw intersects the east line at station 29, then drains west almost to stations 5 and 6, thence south out of the area towards a small lake at station 18.

Almost the entire area is underlaid by glacial drift, principally of granitic origin. The soil is sandy, decomposed rock of the same origin. Solid granite outcrops occur along the east line between stations 33 and 34.

The Forest

The forest description for plot 1 will also suffice for plots 2 and 3, with the exceptions herewith noted:

A longer period has elapsed since plots 2 and 3 were burned over, for the Omak Ridge fire of 1920 was stopped just short of them by a fire trail built south from the shore of Grant Lake. A cursory examination of fire scars has indicated, however, that at least a portion of the area did burn over during the year 1910. Further investigation with respect to this matter is needed.

Dense clumps of ponderosa pine reproduction, in a generally stagnating condition, occur under the mature trees of plot 2 and the southwest portion of plot 3. Several typical saplings from these clumps were found, on examination, to have attained a diameter at the ground line of only one inch during their entire lifetime.

of 30 years.

Dense clumps and extensive patches of ponderosa pine saplings and poles also occur in the northern and northeastern portions of plot 3, though stagnation is not so apparent as on the flats. In the southeastern portion of this plot Douglas fir saplings and poles occur in mixture with the pine, while along the shallow draw, previously mentioned, there occur aspen groves in which a scattering of pine seedlings and saplings have succeeded in establishing themselves.

It was found that there were numerous windfelled snags, many of which obviously resulted from pine beetle attacks antedating the year 1920. More recent epidemic beetle activity of the years 1929-1932 was also indicated by numerous standing snags.

In general it was found that plots 2 and 3 contained larger quantities of heavier inflammable fuel than plot 1. This was especially true in the southeastern portion of plot 3. The reproduction stands were also considerably older than on plot 1 and consisted of a higher percentage of poles, except on the portions of the area where excessive stunting had been caused by growth stagnation.

Method of Burning

On the morning of October 8 the tractor and plow were moved from Colville Agency and fire line construction was started at the northwest corner of plot 2 at the point marked "tie in" on the attached map. From this point due east to station 43, thence northeasterly to station 37 the "cat" and plow worked on a line slashed through the dense stands of saplings and poles. Considerable axe work was necessary along this line as a safety measure to remove the poles that the plow might cause to crash down over the "cat" driver and his machine. As has been explained, it was considered advisable to stay off the trust patented lands to the north.

At station 37 the more open stand of the upper mountain slope was encountered and the "cat" was steered to the east, thence south and southwest along the edge of the reproduction stands. From station 30 south to station 27 it was again necessary to slash through dense sapling and pole thickets, but from 27 south to station 22, it was possible to take advantage of openings along the top of a broad subsidiary ridge. From station 22 west to 18 it was necessary to steer the "cat" on a devious course through clumps of reproduction and across openings to avoid numerous, dangerous standing snags. From station 18 north to the "tie in" an old cattle trail was followed through the thickets and openings.

On arriving at the "tie in" in the middle of the afternoon it was decided to immediately burn a portion of the area. Therefore plot 2 was established by plowing a line south and southwestward from station 9 to station 3.

Backfiring was started at 4 P.M. at the "tie in" by two men, using Hauck torches, who proceeded in opposite directions until they met on the east side of the plot. While this operation was being conducted, the sky was heavily overcast

and the air was still. By 5:30 P.M. the entire area had been burned and the edge near the fire trail had cooled sufficiently to permit the men to return to Colville Agency.

On the morning of October 9 it was found that though no rain had fallen, the sky was still heavily overcast and conditions were still ideal for burning. Accordingly at 9:30 A.M. the backfiring was started at the highest point on the fire trail at station 34. One three-man crew with a Mauck torch proceeded north to station 36, while another three-man crew, using the second Mauck torch, proceeded south to station 32. Backfiring then ceased temporarily and was resumed only at intervals thereafter to make the line secure as the fire burned down the slope. By noon the entire northeastern portion of the plot had been burned and the fire was advancing slowly down hill along a line extending northwestward across the area from stations 31 to 41.

At about this time the sky began clearing and gusty, variable winds started blowing. As the backfiring proceeded south from station 31 it became apparent that because of such conditions we had fire advancing on a front that was too wide. The fire increased considerably in intensity and local "hot spots" developed. No trouble was experienced, however, except for one small spot fire over the line at station 30. This was speedily controlled and backfiring continued along the line to the south. When the fire reached the Douglas fir thickets inside of the line, from station 27 south to 22, numerous "blow ups" occurred and the mushrooms of black smoke billowing into the sky caused considerable alarm amongst more distant, chance observers.

By late afternoon when the backfiring along the east line of the tract reached station 23 and the sky was again becoming heavily overcast, and a steady breeze from the southwest had developed. By this time the entire north line had been backfired and made secure and the fire was advancing on a wide, irregular front. Under such conditions the advisability of backfiring from station 23 west along the line on the windward side of the plot was debatable. It was decided, however, that because of the long fire front it was advisable to backfire the remaining line and to make it secure before leaving for the night. From station 23 west to station 3, therefore, the fire had the wind behind it as it swept through the thickets with considerable speed and intensity. By 6:30 P.M., the line had cooled sufficiently to be safe and the crew returned to Colville Agency.

On the date of October 10 a small crew patrolled the line and felled several dangerous burning snags. No further patrol was necessary.

Costs

The following are all of the costs connected with the actual burning of plots 2 and 3:

Salaries and Wages:

<u>Name</u>	<u>Rate</u>	<u>No. Days</u>	<u>Amount</u>
Harold Weaver	\$11.74	1½	\$17.61
Pete Whitelaw	6.00	3	18.00
Mathew Dick	6.00	2	12.00
Sam Sturgis	5.25	2	10.50
Walter Moomaw	6.10	3	18.30
Johnson Simpson	5.25	1	5.25
Total		<u>12½</u>	<u>\$81.66</u>

Other expenses:

Tractor Hire	6 hrs. work @ \$1.80	\$10.80
" "	10 " standby @ .90	9.00
Chevrolet Truck	29 miles @ .20	5.80
Pickup Truck	87 " @ .09	7.83
Coupe	87 " @ .05	4.35
Coach	98 " @ .05	2.90
Total		<u>\$40.69</u>
Total Cost		<u>\$122.34</u>

Cost per acre burned of 123.5 acres in combined plots \$.99

Results

As with the burning of plot 1, it is too early to make authoritative statements with respect to the results obtained. At this early date the experiment appears to be very successful. Severe killing of the adjacent saplings and poles occurred wherever masses of heavy fuel burned, but the great majority of the dominants and co-dominants of these trees, scattered quite uniformly over the area, were less severely scorched. Most of them apparently have an excellent chance of survival and of eventual accelerated growth. The most severe scorching occurred in the Douglas fir thickets and in the southern portion of plot 3 where, as has been explained, the fire was pushed by the wind. Even there many of the dominant and co-dominant saplings and poles appear to have an excellent chance of survival and will, it is hoped, comprise a reproduction stand of sufficient density.

Several mature trees were killed because of the burning out of older extensive fire scars. It is planned to make a more complete survey of this damage during the spring of 1943.

Also after the growing season is well started it is planned to establish sample plots and to make live and dead counts of the saplings and poles thereon. It is regretted that because of the small forestry staff and the press of necessary routine duties in connection with timber sales and other administrative tasks, it has not been possible thus far to make an intensive study of plots 2 and 3.

With respect to burning technique, it was learned that on this particular area, under the conditions then prevailing, it would perhaps have been advisable to have further subdivided plot 3 into several smaller plots. Then the burning could have been conducted on smaller fronts and could have been more readily controlled. This could have been accomplished at little additional cost. The technique employed will eventually be judged by the results obtained, however, and if it is determined that uniformly good thinning and accelerated growth have been obtained the method used will have been proved adequate.

Recommendations

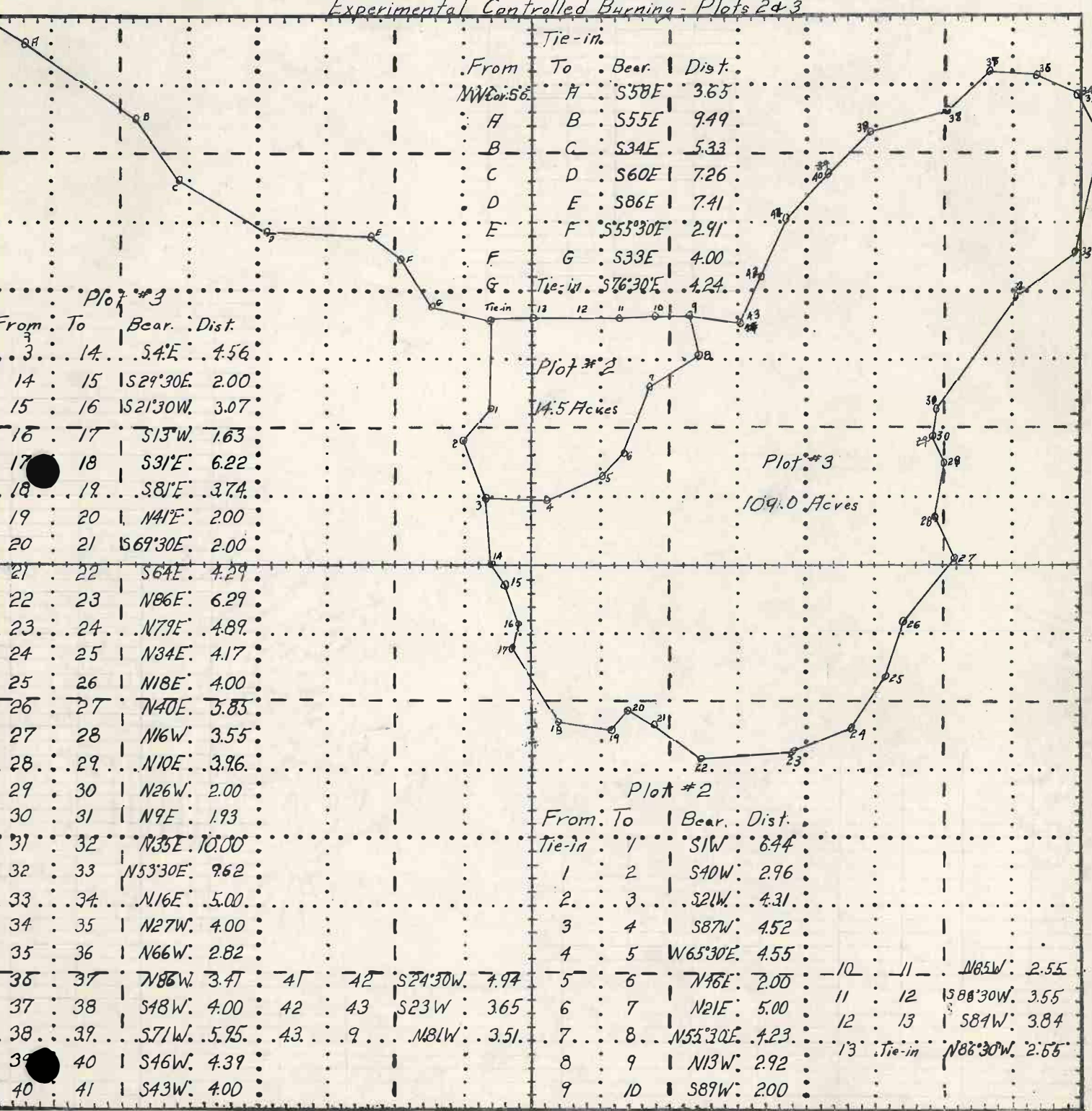
It is recommended that the sample plots be established and the annual spring and fall studies be made of the saplings and poles growing thereon.

Since plots 2 and 3 are not being as intensively studied as plot 1 there will be no object in excluding logging operations for the next several years. Damage to the reproduction stands should be held to a minimum, however, and slash created by logging should be promptly disposed of.

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS
FOREST TOPOGRAPHER'S LARGE MAP SHEET

Galville Indian Reservation. T. 31N N., R. 32E., Sec. 6 Contour Interval, feet. Scale: 8 inches = one mile.

Cruiser Van Sick, E. & Macdonald Dates 11-25-48 Topographer



PLOTS 4 and 5

As has been indicated, Plot 1 was burned on the date of October 6, 1942, and plots 2 and 3 were burned on the dates of October 8, 9, and 10. The expected rain storms failed to materialize and the weather continued dry, though generally cloudy. Plots 4 and 5 were burned on the dates of October 13 and 14. Since these plots are contiguous one description with respect to location, geologic and topographic features and forest conditions will suffice for both.

Location and Area

Both plots are principally confined to tribal lands in the southeast quarter of section 10, township 31 north, range 29 east, Willamette Meridian, though the burn also covers a fringe of trust allotted timber in the northeast quarter of section 10 and a small area in the southwest quarter. With respect to area, plot 4 contains 28.5 acres and plot 5 a total of 65 acres. A compass traverse map, entitled "Experimental Controlled Burning, Plots 4 and 5", is attached hereto.

Topographic and Geologic Features

The area included within plots 4 and 5 lies on the gently rolling, glacial moraine hills comprising the summit of the broad divide between the watersheds of Coyote Creek and Kartar Creek. Granite boulders abound and the soil is derived principally through decomposition of the same material. In the northwest portion of plot 4 and the northeast portion of plot 5 there occurs an extensive natural depression that appears to be typical of moraine deposits in the Kartar region.

The Forest

The forest description for plot 1 will largely suffice for plots 4 and 5. The entire area included therein is almost uniformly covered with a dense stand of ponderosa pine sapling and pole reproduction, under a patchy and in some places sparse overstory of mature trees. That severe pine beetle attacks have occurred in the past is attested by the numerous windfelled and standing snags.

Growth stagnation is becoming evident throughout the entire reproduction stand, except in the above mentioned depression, where, probably because of abundant soil moisture, the pole stand evidences exceptional growth for ponderosa pine in this region. The poles in this depression are in fact so tall and so slender, because of the dense crowding, that many of them have been severely bent and broken from heavy snow storms of recent years.

Lack of time prevented investigation of the recent fire history of this stand as completely as desired. One fire scar indicated that a burn occurred during the year 1910. It therefore appears that at least a portion, if not all, of the area was burned over during that year. It is understood that the great Oak Ridge fire of 1920 did not reach this area, for it was stopped along the north side of the Coyote Creek Road, which comprises the north boundary of plot 4.

Method of Burning

On the morning of October 13 the tractor and plow were moved to the area from Colville Agency and fire line construction was started towards the west from the Coyote Creek Road at station 41. From this point to station 32, it was necessary to slash and plow through dense reproduction. From station 32 south to station 19 it was possible to take advantage of a small meadow and the natural openings, though some thick reproduction was encountered. From station 19 east and north to station 1, on the Coyote Creek Road, it was possible to plow along the outside edge of the dense reproduction stand.

With the experience of burning plot 3 freshly in mind, it was decided to divide the area by subsidiary fire lines into several smaller portions. ~~According-~~ ly plot 4 was segregated from the larger area by plowing a fire line north and northwesterly from station 8 to station 41.

The burning of plot 4 was started at 3:30 P.M. and was completed without incident by 5:30 P.M. at which time the crew returned to the Agency. With respect to weather, the sky was partially overcast and the air was quiet during the burning.

The burning of plot 5 was started at 9:30 A.M. on the morning of October 14. The sky at this time was heavily overcast and during the morning a very light rain fell. The fire ran readily through the dense patches of reproduction where it could feed on the heavy ground cover of pine needles, but stopped at the edges of most of the grassy openings. It was therefore necessary to set numerous fires by means of the Hauk torches in various portions of the plot.

Costs

The following are all the costs connected with the actual burning of Plots 4 and 5.

Salaries and Wages

Name	Rate	No. Days	Amount
Harold Weaver	\$11.74	1	\$11.74
William Eastman	11.74	1	11.74
Pete Whitelaw	6.00	2	12.00
Mathew Dick	6.00	2	12.00
Sam Sturgis	5.25	2	10.50
Walter Mosman	6.10	2	12.20
Johnson Simpson	5.25	2	10.50
Total		12	\$80.68

Other Expenses

Tractor Hire	6 hrs. work @ \$1.80	\$10.80
" "	3 " standby @ .90	2.70
Chevrolet Truck	39 miles @ .20	7.80
Pickup Truck	78 " @ .09	7.02
Coupe	78 " @ .05	3.90
Coach	39 " @ .05	1.95
Total Cost		\$34.17
		\$114.85

Average cost per acre of burning 93.5 Acres 1.23

Results

An excellent, uniform burn was obtained over the greatest portion of plot 4, except in the depression in the extreme northwest corner, where the grass was still partly green. On plot 5 a uniform burn was not obtained. Over the greatest portion of the area, however, a partial scorching of the reproduction was obtained, particularly where logs, snags or other heavy fuel burned. As with the other plots it will be necessary to wait for at least one year to more fully evaluate the effects of the burning.

It is hoped that it will be possible to establish sample plots on which to make annual spring and fall studies with respect to percentage of kill, accelerated growth of surviving trees, etc.

Recommendations

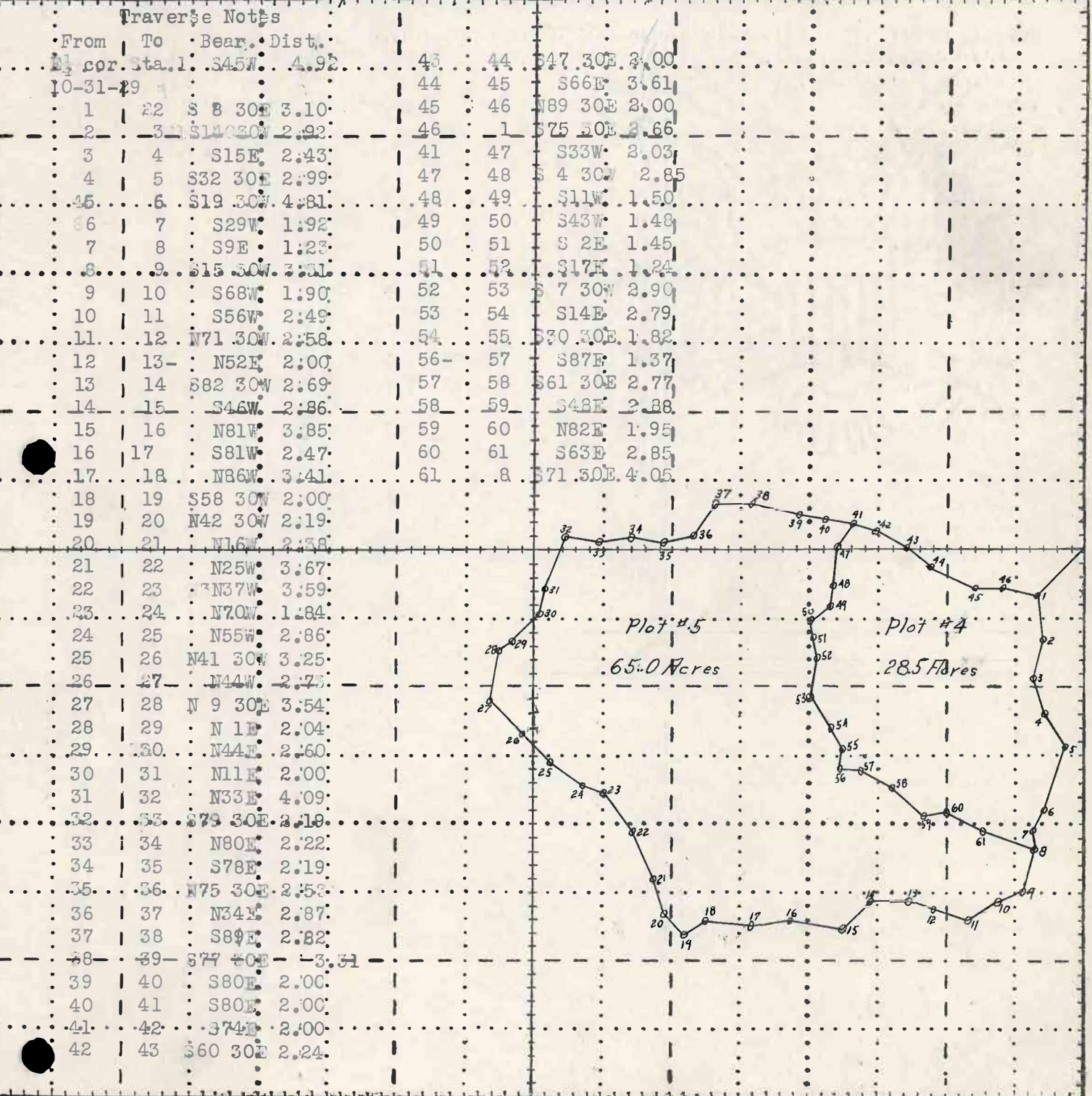
Since plots 4 and 5 will not be as intensively studied as plot 1 there will be no object in excluding logging operations for a number of years. Such operations should be closely supervised, however, to prevent excessive damage to the reproduction. Also, slash resulting from logging operation should be compactly piled and disposed of at the earliest opportunity.

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS
FOREST TOPOGRAPHER'S LARGE MAP SHEET

Colville Indian Reservation. T. 31N, R. 29E, Sec. 10 Contour Interval, feet. Scale: 8 inches=one mile.

Cruiser Van Sickle & Maxson Dates 12-17-22 Topographer

Experimental Controlled Burning Plots 4 & 5



SUMMARY AND CONCLUSIONS

The five plots totaling 238.5 acres in area were burned at a total cost of \$290.99 and an average cost of \$1.22 per acre. With added experience and under other than experimental conditions the writer believes that such burning can be reduced to less than 60 cents per acre.

As has been previously indicated, artificial hand thinning methods could have been used on the plots. The costs of such operations apparently vary from \$10 to \$20 per acre, depending on stand conditions and the intensity of the method employed. If it is assumed that the average cost per acre would amount to \$15.00 the total cost of thinning the 238.5 acres would be \$3577.50, a sum exceeding by over 12 times the amount actually spent on the controlled burning. As has also been previously indicated, the writer doubts that such heavy expenditures can ever be justified on the greatest portion of the ponderosa pine region.

Also, it would be impossible for \$15.00 per acre to reduce the fire hazard through the removal of the snags, down logs and other debris. The hazard would, in fact, be greatly increased because of the slash resulting from the thinning operations. Under such conditions any uncontrolled summer fire would most certainly be hot enough to do tremendous damage and, quite probably, would entirely destroy the stand and the heavy thinning investment. Theoretically such stands can be protected by means of heavy investments in fire breaks, fire fighting equipment and personnel. Unfortunately, however, theory and practice are not always synonymous and where such extremely hazardous conditions exist in the dry ponderosa pine region disastrous fires have been known to occur in spite of the best facilities, equipment and personnel.

In the summer of 1939, for instance, on a national forest in the Black Hills of South Dakota, a fire made a nearly complete kill on 22,000 acres. Most of the area burned, it is reported, consisted of thinned stands of ponderosa pine, presumably of pole size, in which the thinning slash formed a continuous layer of fuel of varying density. If it is assumed that 15,000 acres of the area burned were so thinned at an average cost per acre of \$15.00, it is probable that the fire destroyed an investment of taxpayer's money amounting to \$225,000.00, together with the almost inestimable value of the stand itself.

Black Hills forest conditions are not known to this writer. Suppose, however, that fire could have been successfully used as a silvicultural medium for the thinning of this stand. The cost would have been much less. At \$1.00 per acre it would have amounted to only \$15,000.00, one fifteenth of the cost of thinning by hand. Also, the fire hazard would have been lowered through the disposal of the heavier fuels and other debris. Under such conditions it is conceivable that the fire might have been confined to a smaller area and that the damage on the area burned might not have been so severe.

It is precisely for the determination of the feasibility of using fire for such purposes that the experiment herein described has been started. Commercial

forestry certainly should pay for itself, but such it can hardly do in the ponderosa pine forests if it is first necessary to expend tremendous sums of the tax payer's money for the thinning of hundreds of thousands, even millions, of acres of stagnating reproduction, and for the subsequent protection of such hazardous stands. Neither can foresters continue to permit these stands to stagnate for vast areas are being rendered non-productive thereby. It might even be better to burn off these areas completely, then plant grass thereon for cattle and sheep to eat, and for foresters to concentrate on growing tree crops on more highly productive areas.

It is admitted that experimenting with fire as a silvicultural agent is risky, but it is certainly preferable to doing nothing. If successful it may some day be widely used and recognized, as it should be, as a valuable silvicultural tool for use under certain conditions on vast areas of the ponderosa pine region.

The local forestry staff is small and its time must of necessity be largely taken up by administrative matters. It is planned, however, to continue the studies on plot 1 and, if other duties will permit, to study the other plots more intensively. Also it is planned to experiment with spring burning of similar reproduction stands.

PHOTOGRAPHIC SUPPLEMENT

The photos presented herein were taken by the writer with his personally owned 9 by 12 centimeter Zeiss Ikon Ideal B Camera. Films were processed and enlargements were made by him.

Heavy Orange "G" filter was used in taking the pictures to bring out contrast between green and scorched foliage. Unfortunately, lighting was very poor for this type of photography due to the lateness of the season and the long shadows cast by the larger trees. Considerable pertinent detail can be seen however.

Points from which these photos were taken have been permanently marked and witnessed so that the same scenes can be photographed in future years.

Photo No. 1

Camera Point No. 2

Plot No. 1

Late October view due north across reproduction stand, subsequent to burning. Note scorched poles on far side of opening to the right of center. These will be commented on in further detail under Photo No. 1, Camera Point No. 4.



Photo No. 2

Camera Point No. 2

Plot No. 1

This enlargement, made on out-dated Eastman News Bromide, of a photo taken in early November in afternoon sunlight, shows slightly better contrast between darker green foliage and lighter colored scorched foliage.

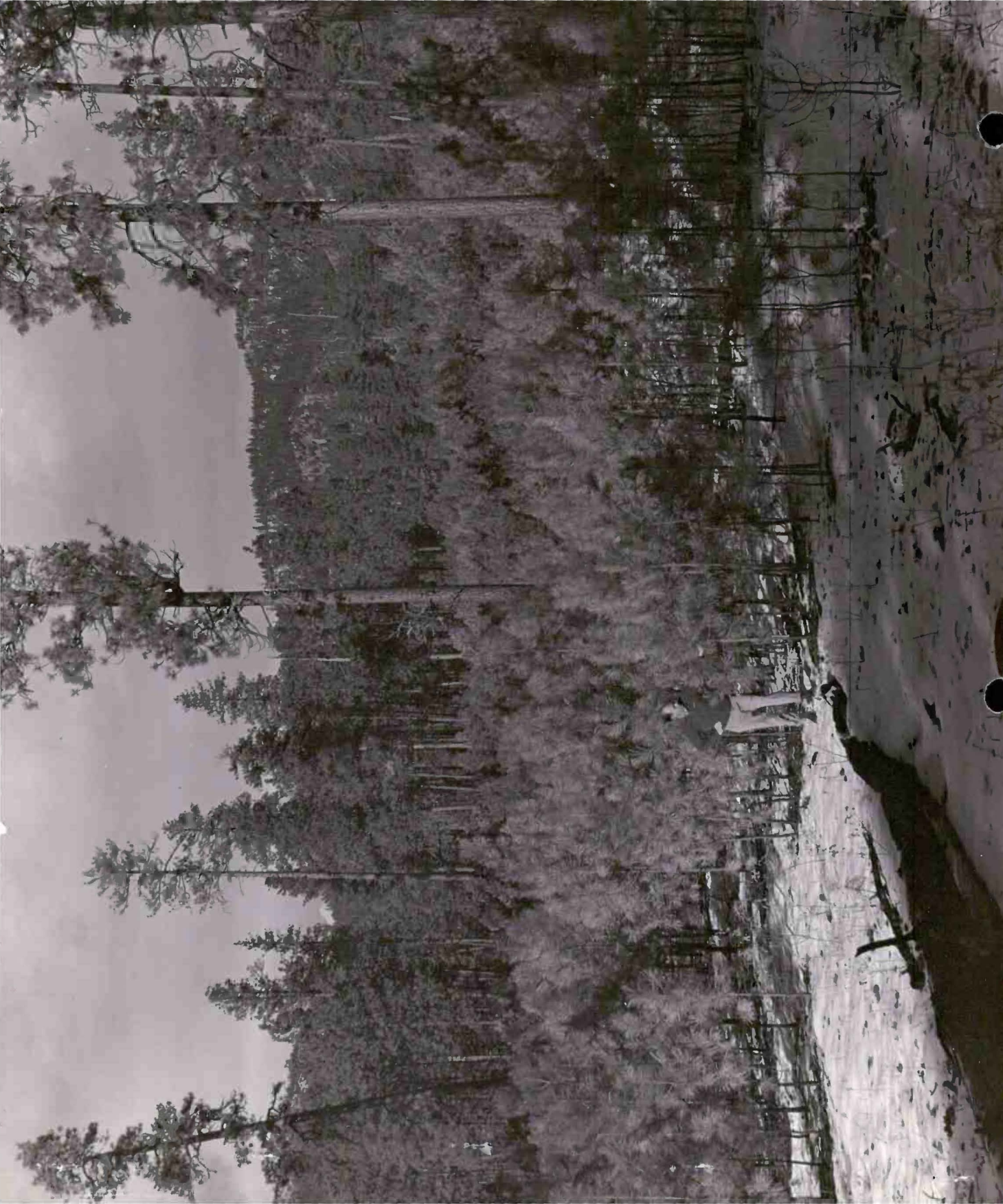


Photo No. 1

Camera Point No. 3

Plot No. 1

View to northwest across plot, showing dense reproduction stand before burning. Photo taken October 6, 1942.

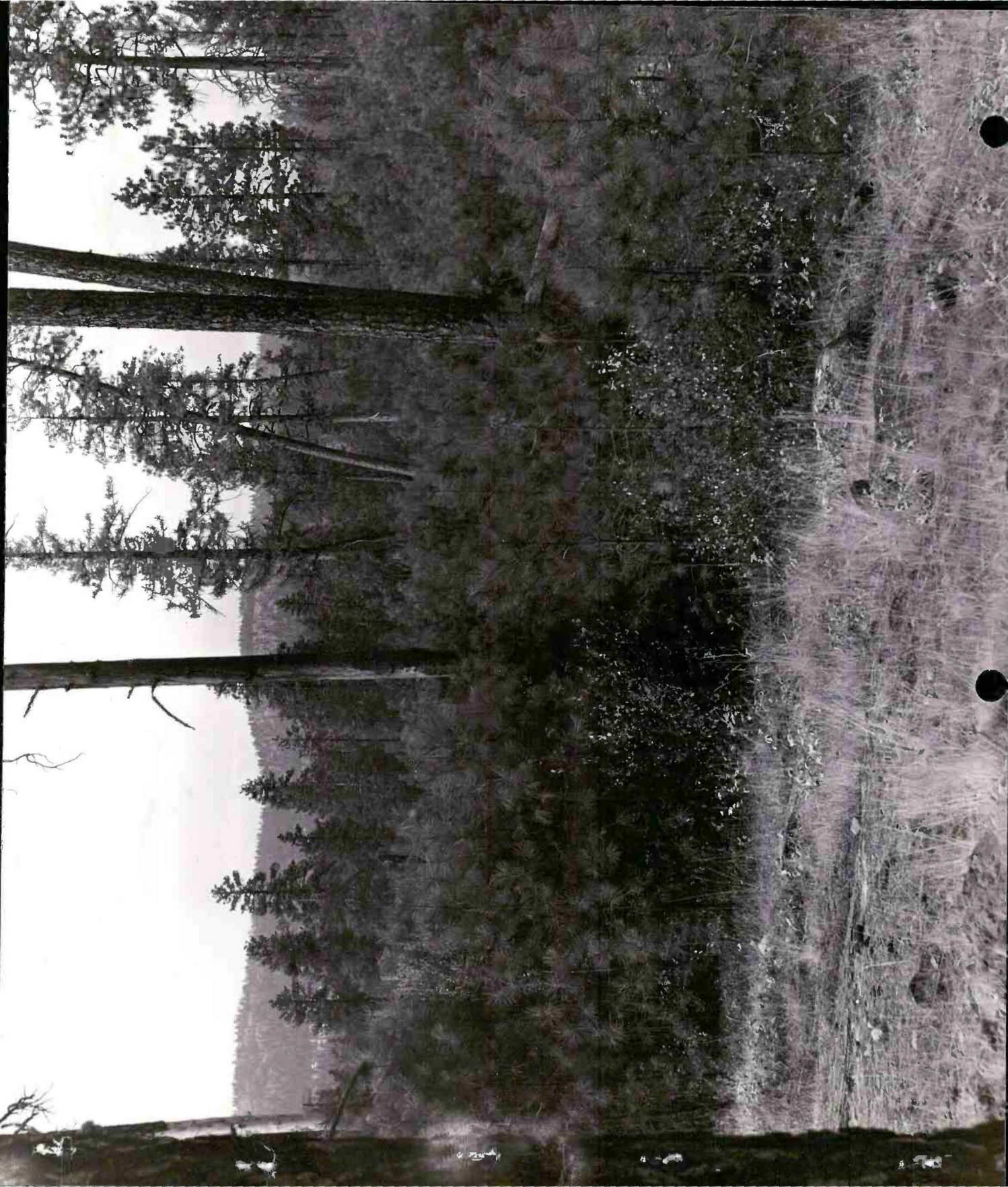


Photo No. 1

Camera Point No. 4

Plot No. 1

Late October view due west across north portion of plot, subsequent to burning. Observe left of center the scorched poles that can be seen in photo No. 1, Camera Point No. 2. This scorching was caused by burning of large, resinous windfelled snag on windward side.



Photo No. 1

Camera Point No. 1

Plot No. 4

Late October view, showing portion of dense re-
production stand, subsequent to burning.

